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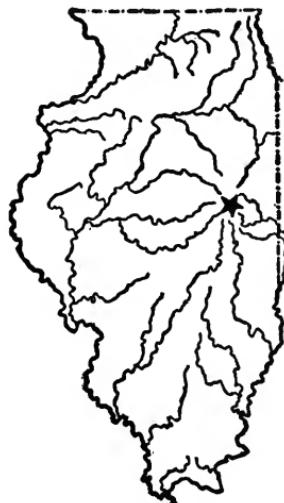
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VARIETIES OF OATS FOR ILLINOIS

By G. H. DUNGAN and W. L. BURLISON



URBANA, ILLINOIS, DECEMBER, 1929

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VARIETIES OF OATS FOR ILLINOIS

By G. H. DUNGAN and W. L. BURLISON¹

Approximately four million acres of Illinois land are devoted every year to the growing of oats. In spite of the fact that oats during the last few years have been considered an unprofitable crop, there has been no perceptible falling off in their production either in Illinois or in the United States as a whole. Neither does the world's production show any tendency downward.

Because of the several advantages possessed by oats they are likely to continue to be grown extensively for many years. There is a marked tendency at the present time, however, to substitute barley and soybeans for a part of the oats crop, but this has not materially reduced the oat acreage in Illinois. Since oats are grown on such a large area, and so generally return an unsatisfactory income, especially when the grain is sold in the open market,² it is especially important that the highest-yielding varieties be selected for growing and the most economical methods be employed in their culture. This bulletin gives the results of variety tests and experiments on different rates and methods of seeding made by the Illinois Agricultural Experiment Station during the past fourteen years.

PLACE OF OATS IN ILLINOIS AGRICULTURE

Adapted to Corn-Belt Rotations. Even tho oats as a crop do not return a great direct profit, they do render benefits which are sometimes overlooked. According to the practice in the corn belt, oats commonly follow corn in the rotation, and they probably are better adapted to this particular position in the rotation than any other crop. Oats may be sown before the work of preparing the corn land is pressing. They can be broadcast and worked into the soil rather roughly with fairly satisfactory results. Even tho the yield of oats is increased by seeding on plowed ground that has been worked down to a good seed bed and by sowing with a drill, the practical method seems to be in favor of broadcast seeding and covering with a disk. The great advantage of this method is the fact that a relatively large area can be seeded in a short time. The time saved will usually yield greater

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²The price of oats naturally varies with the combined supplies of oats and other feedstuffs, more particularly with corn. In this connection Department Bulletin 1351 of the U. S. Department of Agriculture, "What Makes the Price of Oats," by Hugh B. Killough, 1925, will be of interest to many readers.

returns when applied toward preparing the land for corn, making it possible to plant the corn crop a few days earlier.

The system of rotating corn and oats is not so injurious to the productivity of the soil as growing corn every year. On the Morrow plots at the University of Illinois, where corn has been grown every year since 1879 without soil treatment, the last 23-year average yield of corn is 25.1 bushels an acre, whereas on the nearby plot that has been cropped to corn and oats alternately, the yield of corn for the same period is 35.6 bushels an acre. The average yield of oats during this period is 34.0 bushels an acre. The average value of the crops produced each year on the corn and oats plot, according to the average December 1 price, is \$4.57 an acre more than that of the corn from the continuous-corn plot.

It is commonly conceded that changing from corn to oats and then back to corn is not a good rotation, yet there are certain advantages in the practice. Also the cost of labor required to produce a crop of oats is considerably less than that needed to grow a crop of corn. Another advantage which the culture of oats affords is the opportunity of obtaining a stand of clover. Altho barley is generally conceded to be the best nurse crop for clover and alfalfa, it is not greatly superior in this respect to the early-maturing varieties of oats.

Have Assured Place on Livestock Farms. Oats are an excellent feed for growing animals, and for that reason they have a place on every livestock farm. When fed in the right way they will return an income far in excess of any general market price that has been received for them since 1920.

VARIETY TESTS OF OATS

The varieties chosen for use in these experiments were either well known and generally grown in some section of the state, or were new varieties that possessed desirable characteristics and promise of being adapted to some part of Illinois.

An attempt was made to obtain pure seed of all new varieties, and after their introduction care was taken to keep down the percentage of mixtures with other varieties by hand-separating the plants in adjoining plots before harvest, and by taking special pains to clean the separator thoroly after threshing each variety. Even with this care, some mixing occurred, and it was found desirable in some instances to obtain a new supply of pure seed or to carefully hand-rogue the mixed varieties in the field before they were harvested. By these methods it is believed that the purity of the varieties was maintained to a sufficiently high degree to make the yield data reliable.

The different varieties were grown in comparative test plots on soil that received enough rock phosphate, limestone, and either animal

manure or crop residues to keep the land in a good state of productivity.

The oats were sown with an 8-inch disk drill at the rate of 8 pecks per acre. The plots at Urbana, and during part of the period, those at DeKalb, were 6 drill rows wide, and either 8 or 16 rods long, with a 16-inch space between varieties. This made it possible to have four replications at DeKalb and eight replications at Urbana. During most of the time covered by these tests the plots at DeKalb and Alhambra were 1 rod wide and 16 rods long with a 16-inch alley between varieties.

The weights of grain at threshing time were used in calculating the yields. The average yield of each variety was determined, but this means little in comparing varieties that were grown during different years. The average yield of each variety is therefore compared, on a percentage basis, with the average of all varieties grown during the same years. For example, Iowar oats on the DeKalb field have been grown for eight years (1921-1928) and have yielded an average of 75.2 bushels an acre. The average yield of *all* varieties grown during the same eight-year period is 68.8 bushels. Counting 68.8 as 100 percent, 75.2 has a value of 109.3 percent, which is considered as the percentage rating of Iowar.

The experiment fields from which records were obtained are located in three different sections of the state: at DeKalb, in DeKalb county; at Urbana, in Champaign county; and at Alhambra, in Madison county.

The yields of varieties grown up to and including the season of 1916 were published in Bulletin 195 of this Station. Only those varieties that were grown in and since 1917 are included in the present bulletin, but in calculating the average yields and percentage ratings of the different varieties, all available data have been used, including results prior to 1917.

Tests in Northern Illinois

The five leading varieties among the 43 tested on the DeKalb field since 1916 are Silvermine 6-403 (an Illinois selection), Iowar, Albion (Iowa 103), Richland (Iowa 105), and Kanota, ranking in the order named (Table 1).

The early and medium-late varieties of oats have a close race for first place in yield. The odds, however, during the last ten-year period, have been slightly in favor of the early varieties. The average percentage rating of the five highest-producing early varieties—Iowar, Albion, Richland, Kanota, and Sixty-Day 13-304—is 105.66, which is 1.6 percent or a little over 1 bushel more than that of the five highest-yielding, medium-late varieties—Silvermine 6-403, Iogren, Silvermine, Great American, and Scottish Chief.

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Tests in Central Illinois

Gopher, Abion, Eanora, Richland, and State Pride, in the order named, are the five leading varieties in the Illinois test in central Illinois, from the standpoint of yield of grain. Table 2, Forty-three varieties and one mixture have been grown in this series for a period of three years or more and eight varieties and one mixture for less than three years.

Gopher has both the highest average yield and the highest percentage cutting. Excluding the mixture, Sixty-Day ranks sixth and Minora seventh, followed by Burt, Big Four, and Silvermine 4-402, in the order named. These are all distinctly early varieties with the exception of Minora, Big Four, and Silvermine 4-402, which are medium-late maturing.

The mixture of early varieties—Abion, Richland, Lower State Pride, Sixty-Day, Eanora, and Burt, sown in equal parts—rank fourth in yield at Urbana. This mixture has a higher average yield over the three-year period during which it was grown than any one of the varieties included in it except Abion. From the standpoint of yield of grain there apparently is little to be gained from growing a pure variety provided the mixture is made up of oats of the same general type in respect to time of maturity.

A mixture of medium-late varieties made up of 7 pounds each of Minnesota 6, American Banner, Irish Victor, Silvermine, Inglen, Cornelian, and Nova, has been tested for two years. Seed was sown in plots alongside those in which the pure seed of each of these varieties was seeded. Unlike the results with the early oats, this mixture gave practically the same average yield as that of the component varieties grown separately. Three of the pure varieties produced slightly more than the mixed seed and four yielded a little less than the mixture.

The early varieties at Urbana, as at DeKalb, are more productive on the average than the medium-late ones. During seven of the last twelve years covered by these tests the early varieties have exceeded the medium-late ones in yield. The average percentage cutting of the 16 early varieties grown since 1902 at Urbana is 312.54. This is 12 percent, or 3.8 bushels in acre, greater than that of the 30 medium or late varieties. Temperature and amount of rainfall at certain critical stages during the growing season, are the factors determining the comparative yield obtained from these types. For instance, at Urbana the season of 1928 had the characteristics of a late oat year. Silvermine produced 35.1 bushels to the acre compared with 66.7 for Sixty-Day. Conditions in 1925, which were very different from those in 1928, resulted in 48.0 bushels for Silvermine and 64.1 for Sixty-Day. These seasonal factors are more frequently favorable to the early oats than to the late varieties.

TABLE 2.—CENTRAL ILLINOIS, UMANA FIELD: YIELDS OF VARIETIES OF OATS AND PERCENTAGE RATING BASED ON AVERAGE YIELD OF ALL COMPETING VARIETIES

Rank	Variety	No. yrs. grown prior to 1917	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	Percent- age rating	
															1929	
1	Clopper	0	73.3	63.6	47.3	46.4	46.0	48.4	67.4	76.4	93.2	48.8	67.7	69.3	69.8	108.6
2	Athlon (Iowa 103)	1	.....	.....	.....	.....	.....	.....	72.6	74.8	83.0	71.6	63.1	62.1	69.1	108.0
3	Kanota	0	.....	.....	.....	.....	.....	.....	.....	.....	83.4	84.6	74.1	70.2	68.6	107.9
4	Mixture Early Ohio	0	75.6	65.4	41.2	48.3	42.3	52.3	64.8	71.7	43.5	44.5	89.4	72.0	66.6	106.7
5	Riehlbad (Iowa 105)	0	.....	.....	.....	.....	.....	.....	.....	.....	.....	63.4	66.3	65.4	61.8	106.7
6	State Prize (Wis. 7)	0	11	76.4	61.3	36.2	41.8	41.0	52.8	64.1	67.3	41.4	84.9	63.7	58.0	104.3
7	Sixty-Day	0	.....	.....	.....	.....	.....	43.3	47.0	40.0	67.0	64.6	53.1	82.7	72.0	104.2
8	Minota	0	.....	.....	.....	.....	.....	61.6	34.2	51.8	51.2	38.0	81.3	69.1	68.7	103.5
9	Burt	0	59.2	74.6	30.2	61.6	36.2	35.3	47.0	47.0	78.0	43.8	81.3	52.5	73.6	59.9
10	Bix Four	0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	45.7	103.0
11	Silvermine 6-403	0	.....	.....	.....	.....	.....	36.0	41.5	44.2	64.0	59.0	50.0	61.3	49.9	102.9
12	Sixty-Day 13-364	0	.....	.....	.....	.....	.....	.....	40.4	57.4	64.1	60.0	84.9	67.7	68.0	102.8
13	Iowa	0	.....	.....	.....	.....	.....	.....	.....	.....	.....	66.4	62.3	62.3	63.1	101.7
14	Cornelian	0	2	62.4	63.2	35.0	60.2	36.1	51.4	60.4	76.0	42.3	83.9	58.7	57.8	101.4
15	Great American	0	62.9	66.4	37.3	63.8	34.0	46.3	54.8	74.0	45.1	70.9	54.2	76.1	57.1	100.7
16	Texas Red	0	12	67.6	72.2	35.7	65.7	32.6	40.0	43.3	84.4	63.6	80.2	64.6	76.3	66.4
17	Nova	0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	100.5
18	White Banana	0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	99.8
19	Logren	0	8	70.2	69.6	39.7	63.4	32.1	47.7	48.0	62.3	73.7	44.4	70.6	66.4	100.2
20	Silvermine	0	11	62.5	73.3	38.5	54.5	38.6	52.7	63.6	76.3	49.3	81.8	52.3	63.1	99.1
21	Irish Victor	15	63.1	68.6	33.5	47.8	32.0	46.0	50.0	42.2	45.6	75.6	46.4	70.4	54.3	103.5
22	Bryant Silver Pineapple	1	63.3	62.3	30.7	46.0	36.0	60.0	60.0	42.2	76.0	.....	.....	.....	53.1	98.9
23	Victory	9	60.5	68.6	37.0	63.0	33.2	43.0	43.4	77.2	57.8	78.2	50.9	78.0	61.1	98.3
24	Schlesinger	25	8.1	71.1	70.3	42.5	57.8	33.9	53.0	53.0	63.6	65.5	61.5	65.5	61.5	97.9
25	Minnesota 6	2	70.5	70.3	30.0	52.1	29.6	47.1	48.6	71.7	50.0	65.6	55.2	66.5	66.5	97.8
26	Wisconsin Wonder	13	64.5	70.5	39.3	62.0	33.8	50.0	54.6	76.0	47.7	77.2	46.7	54.7	61.2	96.0
27	American Day (selected)	0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	74.0	68.5	67.9

TABLE 2.—Concluded

Rank	Variety	No. yrs. grown prior to 1917	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	Average	Percent-age rating
29	Swedish Select	6	60.7	67.6	33.4	53.6	26.0	45.9	47.6	70.1	74.8	63.4	77.0	52.3	95.6	
30	Swedish Select	13	54.8	68.4	33.5	54.6	29.9	47.0	46.6	68.5	74.8	63.4	77.0	61.5	94.9	
31	Danish White	11	51.8	70.1	36.8	55.9	31.0	44.7	45.0	41.8	46.7	48.1	51.5	94.9	94.5	
32	Garton 5	2	60.3	68.7	34.4	48.3	26.4	41.8	41.8	41.8	46.7	46.7	50.6	60.5	94.4	
33	President	2	62.8	69.5	33.5	45.9	23.9	41.8	41.8	41.8	46.7	46.7	46.7	46.5	94.1	
34	Miami	0	48.1	65.8	30.3	45.7	31.2	51.1	51.9	49.6	70.6	80.0	46.3	66.6	94.1	
35	Scottish Chief	1	55.5	60.4	33.6	60.5	33.6	46.0	40.9	47.7	61.0	71.7	46.1	57.9	49.7	93.8
36	Lincoln	12	75.8	61.4	40.6	61.4	40.6	40.6	40.6	40.6	40.6	40.6	40.6	46.7	67.7	92.3
37	Kherson	4	56.4	65.4	38.2	54.3	36.2	36.3	47.3	47.3	47.3	47.3	47.3	56.2	91.7	
38	Garton Victor	4	67.2	54.3	38.2	54.3	38.2	36.2	36.3	36.3	36.3	36.3	36.3	47.0	90.0	
39	Early Champion	1	48.3	71.8	26.3	48.6	22.2	22.2	22.2	22.2	22.2	22.2	22.2	37.4	66.2	89.1
40	Silver	0	61.5	63.1	30.8	41.1	30.8	30.8	30.8	30.8	30.8	30.8	30.8	41.5	57.9	89.1
41	White Russian	1	52.1	60.3	30.3	41.1	30.3	30.3	30.3	30.3	30.3	30.3	30.3	41.5	51.0	87.0
42	Mammoth Cluster	3	52.1	60.3	30.3	41.1	30.3	30.3	30.3	30.3	30.3	30.3	30.3	41.5	57.3	86.7
43	Næsgaard	0	52.1	60.3	30.3	41.1	30.3	30.3	30.3	30.3	30.3	30.3	30.3	41.5	59.7	87.2
44	Black Tartarian	7	52.1	60.3	30.3	41.1	30.3	30.3	30.3	30.3	30.3	30.3	30.3	39.7	75.2	

Varieties grown for less than three years

1	Markton	0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	83.5	83.5	118.4
2	Anthony	0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	83.3	83.3	118.2
3	Igold	0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	66.5	64.9	100.8
4	Great Avalanche	0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	70.9	70.9	100.6
5	Nebraska 21	0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	69.9	69.9	99.1
6	Albion (Woodford Co.)	0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	44.1	44.1	98.9
7	Mixture Late Oats	0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	62.0	62.0	97.8
8	Crown	0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	42.4	42.4	87.2
9	Golden Rain	0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	42.3	42.3	83.9

TABLE 3.—SOUTHWESTERN ILLINOIS, ALUMINUM FIELD: YIELDS OF VARIETIES OF OATS AND PERCENTAGE RATING BASED ON AVERAGE YIELD OF ALL COMPETING VARIETIES

Rank	Variety	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	Average	Percent- age rating
1	Vickey	24.2	41.3	19.3	10.7	22.7	44.6	31.3	27.1	30.2	61.2	24.4	109.9
2	Alvernia	28.3	38.3	17.3	10.7	16.6	41.2	26.0	29.3	32.6	61.1	31.5	108.6
3	Albian (Iowa 168)	30.3	42.3	17.2	7.7	13.9	41.3	21.7	29.5	60.6	60.7	31.4	108.3
4	Burt	29.9	40.7	20.8	6.4	29.6	41.0	17.7	28.8	81.2	40.2	30.0	107.9
5	Sky- Day	26.1	47.6	16.6	7.2	26.6	43.1	27.6	26.6	64.7	67.4	31.2	107.6
6	Iowa	26.8	41.2	16.0	10.1	22.8	41.0	10.1	24.7	30.1	20.0	20.0	106.3
7	Great American	26.8	44.9	13.6	10.1	24.7	39.4	31.6	21.9	39.2	66.9	24.0	106.2
8	Silverlan	22.4	34.1	17.7	11.1	17.1	34.1	17.1	21.1	31.1	30.3	23.4	106.0
9	Big Four	22.7	35.1	16.0	9.0	12.0	35.1	16.0	21.1	30.9	30.9	20.5	104.1
10	Wheaton's Wonder	22.7	35.1	16.0	9.0	12.0	35.1	16.0	21.1	30.9	30.9	20.5	104.1
11	Hixson Silver Flame	26.3	35.1	16.0	9.0	12.0	35.1	16.0	21.1	30.9	30.9	20.5	104.1
12	Highland (Iowa 168)	26.9	38.6	16.7	6.7	16.7	7.4	0.0	17.8	24.4	31.2	21.9	103.9
13	White Banana	21.3	36.6	16.7	7.4	0.0	17.8	46.0	24.4	31.2	23.2	23.2	103.9
14	Kansas	22.6	33.7	13.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	103.9
15	President	17.2	60.6	7.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	103.9
16	Texas Red	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	103.9
Varieties grown for less than three years													
1	Mineta	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	60.7	108.4
2	Gopher	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	68.9	105.2
3	Nova	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	60.4	100.7
4	Togold	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	47.0	47.3
5	Southern Black	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	16.2	60.1

Many people place emphasis on the straw of oats as an important product of the crop, and for that reason prefer the later maturing varieties since they produce more straw than the earlier varieties. Under some conditions the larger yields of straw may more than offset the lower average grain-yielding ability of midseason oats. It may be worthy of mention, however, that the quality of the straw from early oats is superior to that from late or midseason oats because of its greater fineness.

Tests in Southwestern Illinois

Of the 16 varieties that have been tested at Alhambra, in southwestern Illinois, for a minimum of four years, the best six are Victory, Silvermine, Albion, Burt, Sixty-Day, and Iowar, in the order named (Table 3).

One of the serious handicaps to successful oat production on the Alhambra field and on the tight-clay subsoils of southern Illinois is the frequent impossibility of sowing the oats early enough. The impervious character of the subsoil and the relatively heavy spring rainfall frequently make the surface soil too wet to work until after the normal oat-seeding date. When oats are sown late, they usually come into the heading stage at a time when the moisture supply is deficient. The yield, under such conditions, is greatly reduced. The best example of such unfavorable conditions at Alhambra occurred in 1922, when 11.1 bushels per acre was the highest yield obtained and two varieties failed completely.

Late seeding is believed by some to be the greatest factor in low oat yields in southern Illinois. In planning the oat-variety tests at Alhambra for the season of 1927, it was decided to sow the oats at approximately the correct time irrespective of the condition of the soil. Accordingly on March 11 one series of 18 plots was "muddled-in." The soil had been fall-plowed and altho the field was soft and had some water standing in the depressions, there was no particular difficulty experienced in sowing the oats with a horse-drawn disk drill. During the night following there came a heavy rain which covered the field with a sheet of surface water, making further seeding operations at that time impractical. Realizing that the hazard of working the soil while wet becomes greater with the advance of the season, no attempt was made to seed the other series on this field until the soil was dry enough to work nicely. This occurred on April 27.

The stand of plants was more uniform on the late-sown plots. On the early-sown plots there was a number of patches where the oats were drowned out. However, the height of plants and the general vigor of the crop were decidedly in favor of the March 11 seeding, which yielded an average of 53.7 bushels an acre, as against 26.1 bushels for the later seeding. It is recognized that it may not be ad-



FIG. 1.—PANICLE, SPIKELET, AND THRESHED GRAIN OF HULL-LESS OATS (A), COMPARED WITH SIXTY-DAY, A HULLED VARIETY (B)

The glumes of hull-less oats are more open in arrangement and each spikelet contains more grains which are less compact than those of Sixty-Day and other hulled varieties. On the average, the hulls on hulled varieties make up approximately 30 percent of the weight of the grain.

visible to sow oats in the mud as a general practice, and the fact is also appreciated that the results of a single experiment should not serve as the sole basis for recommendations, yet the results of this test seem to substantiate the general belief that one of the great hazards to successful oat growing in southern Illinois is late seeding.

HULL-LESS OATS vs. HULLED VARIETIES

A variety of hull-less oats has been grown in the test plots at Urbana during the past five years (Table 4). During two of the five years the hull-less oats have outyielded the average of all hulled varieties in terms of quantity of hulled grain produced per acre. The average superiority of the hull-less is 75.0 pounds. This gives the hull-less type a percentage rating of 101.9, which would place it fourteenth among the 44 varieties grown on the Urbana field.

Yields of hull-less oats can be compared fairly with yields of hulled varieties only after they have been reduced to a hull-free basis. On the average, the hulls on hulled varieties constitute approximately

TABLE 4.—HULL-LESS OATS: ANNUAL YIELDS COMPARED WITH AVERAGE YIELD OF ALL HULLED VARIETIES GROWN DURING SAME YEARS, URBANA
(Pounds grain per acre)

Year	Hull-less	All hulled varieties		Difference above or below hulled	Percentage rating of hull-less based on average weight of hull-free kernels of all hulled varieties
		Threshed grain	Hull-free kernels		
1924.....	1 571.5	2 329.6	1 630.7	— 59.2	96.4
1925.....	934.5	1 427.2	999.0	— 64.5	93.5
1926.....	2 144.0	2 688.0	1 881.6	+262.4	113.9
1927.....	1 102.5	1 872.0	1 310.4	—107.9	84.1
1928.....	1 923.2	2 256.0	1 579.2	+344.0	121.8
Average...	1 535.1	2 114.6	1 480.2	+ 75.0	101.9

30 percent of the weight of the grain. Thirty percent has therefore been deducted from the average yields of the hulled varieties grown in these tests during the same years as the hull-less, in order to put them on a comparable basis with the hull-less.

Hull-less oats are considered by some growers to be superior to hulled varieties for feeding to hogs and poultry. Along with this advantage, however, may be mentioned the difficulty which some growers have had from the spoilage of hull-less oats in storage. The moisture content of hull-less oats, for safe storage in a bin, must be below that required for satisfactory storage of hulled varieties. Hull-less oats also shatter somewhat worse than hulled varieties after they are mature. The loose character of the chaff surrounding the grain of hull-less oats may be observed in Fig. 1.

RATE OF SEEDING OATS

Oats, or any other crop, should be seeded thickly enough to secure the number of plants that will utilize the space and available soil nutrients to the best advantage. Since oat plants are capable of con-

siderable adaptation thru stoling, as well as thru the development of large or small panicles, the rate of seeding may vary rather widely without materially influencing the yield of grain. Some varieties seem able to adjust to varying rates of seeding more readily than others. The results of a test of 6- and 10-peck seedings with 13 varieties in 1911 are shown in Table 5.

Effect on Acre Yields. White Bonanza, in the above test, showed the least ability to adjust to the seeding rate. The 10-peck seeding gave a net increase of 11.7 bushels an acre, or 29.8 percent, over the 6-peck seeding. Sixty-day proved the most capable of adaptation, the yield of grain with the 6-peck seeding being only .9 bushel less than that with the 10-peck seeding. It is possible that the small-

TABLE 5.—RATE OF SEEDING: YIELDS WITH 6- AND 10-PECK SEEDINGS OF DIFFERENT VARIETIES OF OATS, URBANA, 1911
(Bushels per acre)

Variety	Yield at 6-peck seeding	Yield at 10-peck seeding	Difference in favor of 10-peck seeding	Net gain for 10-peck seeding	Percentage net gain for 10-peck seeding
White Bonanza.....	39.2	51.9	12.7	11.7	29.8
Minnesota 6.....	47.1	58.0	10.9	9.9	21.0
American Banner.....	43.8	53.1	9.3	8.3	18.9
Black Gotham (impure)	57.0	65.5	8.5	7.5	13.2
Danish White.....	57.3	64.4	6.9	5.9	10.3
Schoenen.....	63.6	69.8	6.2	5.2	8.2
Lincoln Siber.....	45.0	51.2	6.2	5.2	11.6
Siberian.....	58.0	62.9	4.9	3.9	6.7
Twentieth Century.....	42.9	46.9	4.0	3.0	7.0
Swedish Select.....	56.4	60.2	3.8	2.8	5.0
Irish Victor.....	60.8	63.4	2.6	1.6	2.6
Sixty-Day.....	49.1	50.0	.9	-.1	-.2
Black Gotham (pure).....	42.2	41.4	-.8	-1.8	-4.3
Average.....	50.9	56.8	5.9	4.9	9.6

grained varieties can be seeded at a thinner rate than others because of the greater number of plants obtainable from a given weight or volume of seed.

The average net gain of a 10- over a 6-peck seeding rate was 4.9 bushels an acre, or 9.6 percent. However, the test was too limited, covering only one year and involving but two rates of seeding, to be construed to mean that a 10-peck rate of seeding is always the better. Some amount between 6 and 10 pecks, or in excess of 10 pecks, may be the proper rate.

Further data on the rate of seeding with an 8-inch drill were obtained at Urbana and at DeKalb during the years 1915 to 1921. The results secured at Urbana, expressed in net yields per acre, are shown in Table 6. The rates of seeding varied from as low as 4 pecks to as

TABLE 6.—RATE OF SEEDING: SIXTY-DAY OATS SEEDED AT DIFFERENT RATES, URBANA
(Net yield in bushels per acre)

Rate of seeding (pecks)	1915	1916	1917	1918	1919	1920	1921	Average percent- age rating ¹
4.....	64.4	51.2	.....	.....	35.2	.....	.....	87.0
5.....	.....	.....	83.7	48.5	37.0	41.3	.....	94.2
6.....	.....	.....	.....	.....	.....	.....	.....	93.9
7.....	.....	.....	.....	.....	.....	43.6	57.5	98.4
8.....	69.3	66.6	98.0	47.4	38.6	44.7	.....	100.0
9.....	.....	.....	.....	.....	36.2	39.5	58.3	94.3
10.....	.....	.....	99.5	50.9	.....	42.2	.....	101.1
11.....	.....	.....	.....	.....	34.7	.....	60.3	97.0
12.....	.....	.....	99.3	51.2	.....	.....	.....	104.7
13.....	.....	.....	.....	.....	.....	.....	59.0	101.9
14.....	.....	.....	96.7	49.1	.....	.....	.....	101.2
15.....	.....	.....	.....	.....	.....	.....	58.3	100.7
16.....	76.6	77.4	99.1	51.0	.....	.....	.....	108.9
18.....	.....	.....	97.1	49.0	.....	.....	.....	101.3

¹The percentage rating of the yields for each year was calculated by considering the yield of the 8-peck seeding for that year as 100 percent.

TABLE 7.—RATE OF SEEDING: SILVERMINE OATS SEEDED AT DIFFERENT RATES, DEKALB
(Net yield in bushels per acre)

Rate of seeding (pecks)	1916	1917	1918	1919	1920	1921	Average 1917-21
5.....	.....	75.0	67.5	37.3	78.7	28.2	57.3
6.....	.....	76.2	57.0	38.4	79.9	26.2	55.5
8.....	60.7	77.6	64.7	43.2	84.2	27.4	59.4
10.....	70.4	80.4	64.2	38.5	84.2	24.4	58.3
12.....	66.7	77.8	64.2	40.2	80.9	25.0	57.6
14.....	62.3	79.7	61.5	40.0	79.9	23.9	57.0
16.....	58.0	85.4	58.2	50.3	83.3	22.4	59.9

high as 18 pecks per acre. Altho not all the rates of seeding were represented every year, the figures indicate a tendency for the net yield to increase as the quantity of seed sown is increased. This, in the main, harmonizes with the results secured in tests at the Iowa Station¹ with a number of early varieties of oats.

With Silvermine oats on the DeKalb field the maximum net yield was secured with a 16-peck seeding (Table 7).

Yields per Bushel of Seed Planted. When seed production is a more important consideration than economy of land, as might be the case when starting a new variety the seed of which is scarce, the production per unit of seed would be of interest rather than acre yield. Tables 8 and 9 give an analysis of the yields on this basis.

¹Burnett, L. C. Iogold oats. Iowa Agr. Exp. Sta. Bul. 247. 1928.

TABLE 3.—DATE OF SOWING: SIXTY-DAY DATES SOWN AT DODGEVILLE, IOWA.

Yield per bushel of seed sown.

Date of sowing years	1905	1906	1907	1908	1909	1910	1911	Average percentage yielding
10	Feb. 4	Mar. 2	—	—	Mar. 12	Mar. 9	—	15.4 49
11	—	—	Mar. 15	Mar. 18	Mar. 14	Mar. 12	Mar. 9	15.4 5
12	—	—	Mar. 15	Mar. 18	Mar. 14	Mar. 12	Mar. 9	15.1 1
13	Mar. 7	Mar. 5	Mar. 1	Mar. 1	Mar. 5	Mar. 4	Mar. 4	11.1 6
14	—	—	—	—	Mar. 12	Mar. 6	Mar. 4	10.0 0
15	—	—	—	—	Mar. 12	Mar. 6	Mar. 4	9.9 4
16	—	—	—	—	Mar. 12	Mar. 6	Mar. 4	9.9 4
17	—	—	—	—	Mar. 12	Mar. 6	Mar. 4	9.9 4
18	—	—	—	—	Mar. 12	Mar. 6	Mar. 4	9.9 4
19	—	—	—	—	Mar. 12	Mar. 6	Mar. 4	9.9 4
20	—	—	—	—	Mar. 12	Mar. 6	Mar. 4	9.9 4
21	—	—	—	—	Mar. 12	Mar. 6	Mar. 4	9.9 4
22	—	—	—	—	Mar. 12	Mar. 6	Mar. 4	9.9 4
23	—	—	—	—	Mar. 12	Mar. 6	Mar. 4	9.9 4
24	—	—	—	—	Mar. 12	Mar. 6	Mar. 4	9.9 4
25	—	—	—	—	Mar. 12	Mar. 6	Mar. 4	9.9 4
26	—	—	—	—	Mar. 12	Mar. 6	Mar. 4	9.9 4
27	—	—	—	—	Mar. 12	Mar. 6	Mar. 4	9.9 4
28	—	—	—	—	Mar. 12	Mar. 6	Mar. 4	9.9 4
29	—	—	—	—	Mar. 12	Mar. 6	Mar. 4	9.9 4
30	—	—	—	—	Mar. 12	Mar. 6	Mar. 4	9.9 4
31	—	—	—	—	Mar. 12	Mar. 6	Mar. 4	9.9 4

See footnote to Table 1.

TABLE 4.—DATE OF SOWING: SILVERMINE DATES SOWN AT DODGEVILLE, IOWA.

Yield per bushel of seed sown.

Date of sowing years	1905	1906	1907	1908	1909	1910	1911	Average percentage yielding
10	—	—	Mar. 1	Mar. 1	Mar. 5	Mar. 1	Mar. 6	45.9 9
11	—	—	Mar. 1	Mar. 1	Mar. 5	Mar. 1	Mar. 6	45.9 9
12	Mar. 6	Mar. 5	Mar. 1	Mar. 1	Mar. 5	Mar. 1	Mar. 6	45.9 9
13	—	—	Mar. 1	Mar. 1	Mar. 5	Mar. 1	Mar. 6	45.9 9
14	—	—	Mar. 1	Mar. 1	Mar. 5	Mar. 1	Mar. 6	45.9 9
15	—	—	Mar. 1	Mar. 1	Mar. 5	Mar. 1	Mar. 6	45.9 9
16	—	—	Mar. 1	Mar. 1	Mar. 5	Mar. 1	Mar. 6	45.9 9
17	—	—	Mar. 1	Mar. 1	Mar. 5	Mar. 1	Mar. 6	45.9 9
18	—	—	Mar. 1	Mar. 1	Mar. 5	Mar. 1	Mar. 6	45.9 9
19	—	—	Mar. 1	Mar. 1	Mar. 5	Mar. 1	Mar. 6	45.9 9
20	—	—	Mar. 1	Mar. 1	Mar. 5	Mar. 1	Mar. 6	45.9 9
21	—	—	Mar. 1	Mar. 1	Mar. 5	Mar. 1	Mar. 6	45.9 9
22	—	—	Mar. 1	Mar. 1	Mar. 5	Mar. 1	Mar. 6	45.9 9
23	—	—	Mar. 1	Mar. 1	Mar. 5	Mar. 1	Mar. 6	45.9 9
24	—	—	Mar. 1	Mar. 1	Mar. 5	Mar. 1	Mar. 6	45.9 9
25	—	—	Mar. 1	Mar. 1	Mar. 5	Mar. 1	Mar. 6	45.9 9
26	—	—	Mar. 1	Mar. 1	Mar. 5	Mar. 1	Mar. 6	45.9 9
27	—	—	Mar. 1	Mar. 1	Mar. 5	Mar. 1	Mar. 6	45.9 9
28	—	—	Mar. 1	Mar. 1	Mar. 5	Mar. 1	Mar. 6	45.9 9
29	—	—	Mar. 1	Mar. 1	Mar. 5	Mar. 1	Mar. 6	45.9 9
30	—	—	Mar. 1	Mar. 1	Mar. 5	Mar. 1	Mar. 6	45.9 9
31	—	—	Mar. 1	Mar. 1	Mar. 5	Mar. 1	Mar. 6	45.9 9

With each increase in time of sowing there was a consistent dropping of a yield per bushel of seed used. A 4-peck seeding of Sixty-Day date in October produced 17.2 percent more seed than in a 5-peck seeding, and in 16-peck seeding produced only 45.1 percent as much. Table 3. In other words, the efficiency of a given quantity of seed was increased from 45.1 percent to 17.2 percent, or 2.9 times, by seeding in a 4-peck rate rather than in a 16-peck rate. Silvermine in the Iowash field shows the same general relation, Table 4. The efficiency of each unit of seed was increased from 15.0 percent to 45.9 percent, or a little over three times, by seeding in a 5-peck rate rather than in a 16-peck rate.

It seems clear from the data that a given quantity of seed can be made to produce more grain when sown thin than when sown thick.

DISTANCE BETWEEN DRILL ROWS

A number of years ago considerable publicity was given to the assumed superiority of a 4-inch drill over an 8-inch drill for seeding small grains. The theory of the 4-inch row is good from the sound-point of a better distribution of plants.

In order to obtain some definite information regarding this question a three-year test was made at Urbana with plots seeded in 4-inch and 8-inch drill rows. A serious difficulty is encountered, however, in attempting to compare the merits of 4- and 8-inch seeding because it is not always possible to sow an equivalent area with an equal quantity of seed. Whether the 4-inch seeding is made by doubling with an 8-inch drill, having the gauge set at half, or by the use of a 4-inch

TABLE 10.—SPACING OF ROWS: Average Yields of Sixty-Day Oats Sown in 4- and 8-Inch Rows, Urbana

(Bushels and pounds per acre)

Year	Rate of seeding		Grain yield with rock phosphate		Grain yield with rock phosphate	
	4" rows		8" rows		4" rows	
	bu.	bu.	bu.	bu.	bu.	bu.
1919	43.2	43.2	40.5	38.5	36.7	36.0
	45.3	45.2	43.0	40.6	42.0	37.0
1920	50.1	51.2	53.7	46.7	55.9	38.5
	62.4	60.1	55.6	55.4	51.7	36.0
1921	70.0	74.2	55.9	60.6	48.2	49.5
	91.6	89.3	76.3	63.1	57.8	45.6
Average	63.5	63.2	49.6	49.1	46.5	46.9

drill with the gauge set at the full rate, a rather wide variation frequently occurs in the amount of seed actually sown. The results included in Table 10 were selected from among others because they were obtained from seeding approximately the same amount of grain in each of the two plots compared.

Seasonal influence appears to be a determining factor in the question of drill-row width. In 1921 the 8-inch rows produced the higher yields, while in 1919 and 1920 the 4-inch method of seeding excelled. The average yields of the two methods were practically the same on land to which rock phosphate had been applied, but on nonphosphated plots the 4-inch rows exceeded the 8-inch rows by 2.6 bushels in acre. In view of the limited data, however, this difference, even on nonphosphated soil, is probably not significant.

Another consideration which may at times quite overshadow any slight difference in yield obtained from wide or narrow drill rows, is the influence that the space between drill rows may have on the chance of securing a stand of clover in the oats. The oat variety tests, as

already stated were conducted in small plots with six drill rows devoted to each variety and with a 16-inch space separating the different varieties. Red clover is regularly seeded in the cuts, the seed being distributed alike over the 8-inch spaces between drill rows of the same variety and the 16-inch spaces between drill rows of different varieties. After the cuts are harvested, it is commonly observed that the clover plants are not only more numerous per unit of area, but also larger in size, in the 16-inch space than between the 8-inch drill rows (Fig. 2).



FIG. 1.—Effect of Distance Between Cut Drill Rows on Stand of Clover.

By looking closely at this picture, it will be observed that the clover plants are noticeably thicker in the 16-inch space separating cut varieties than in the 8-inch spaces between drill rows.

This may be due to the greater accessibility of the sunlight to the plants in the wider spaces, as well as to a somewhat greater quantity of available moisture and mineral nutrient materials. With favorable growing conditions after harvest this visual difference in clover growth usually disappears, but if the trials incident to getting thru the winter are severe, the advantage gained by growing in a 16-inch row may be observable in the spring stand. This condition occurred in the spring of 1928, when a number of counts were made in positions selected at random. The data are presented in Table 11.

While the average number of clover plants is greater in all cases in the 16-inch space than in the two 8-inch spaces, the great advantage of a 16-inch space appears to be on land to which rock phosphate and limestone have not been applied. The average stand on the plots

to which crop residues alone or manure alone had been added was increased 129 percent; whereas on the plots receiving crop residues, rock phosphate, and limestone, the average stand was increased only 21 percent by the double-width row.

It is not here advocated that oats be sown in 16-inch rows in order to insure a stand of clover, for research on this point has not covered enough conditions to warrant such a recommendation, yet the results obtained do suggest the probability that such a practice may be advisable under some conditions. There is little doubt but that the yield of oats would be somewhat lower if sown in 16-inch drill rows rather than in the standard 8-inch rows. Yet, if the same amount of seed were sown per acre, there probably would not be a great reduction in yield. For instance, in 1927 some tests were made in which Sixty-Day

TABLE 11.—WINTER SURVIVAL OF CLOVER PLANTS: AS INFLUENCED BY 8- AND 16-INCH DRILL ROWS OF OATS, URBANA, 1928

	Average number of clover plants in 2 strips 8 inches by 3 feet	Number of plants in one 16-inch space in 3-foot strip
Soil treatment: residues, rock phosphate, and limestone		
Area 1.....	16	22
Area 2.....	25	32
Area 3.....	20	30
Area 4.....	22	30
Area 5.....	36	51
Average.....	24.4	33.0
Soil treatment: residues and manure		
Area 6.....	17	45
Area 7.....	14	15
Area 8.....	11	29
Area 9.....	10	25
Area 10.....	19	38
Average.....	14.2	31.4

TABLE 12.—SPACING OF ROWS: AVERAGE YIELDS WITH OATS SOWN IN 8-, 12-, AND 16-INCH ROWS, USING 11 GRAMS OF SEED TO A ROW, URBANA, 1927

Variety	Distance between rows	Rate of seeding per acre	Yield of	Yield of
			grains	bu.
Sixty-Day.....	8	96.6	169.5	46.3
	12	64.4	257.2	55.0
	16	48.3	304.5	41.6
Silvermine.....	8	96.6	116.7	32.3
	12	64.4	175.2	31.9
	16	48.3	207.0	28.6

and Silvermine oats were seeded in rod rows spaced 8, 12, and 16 inches apart. The same quantity of seed (11 grams) was used in each row. The difference in the yield of Sixty-Day oats in 8- and 16-inch rows was only 4.7 bushels an acre, and in the case of Silvermine

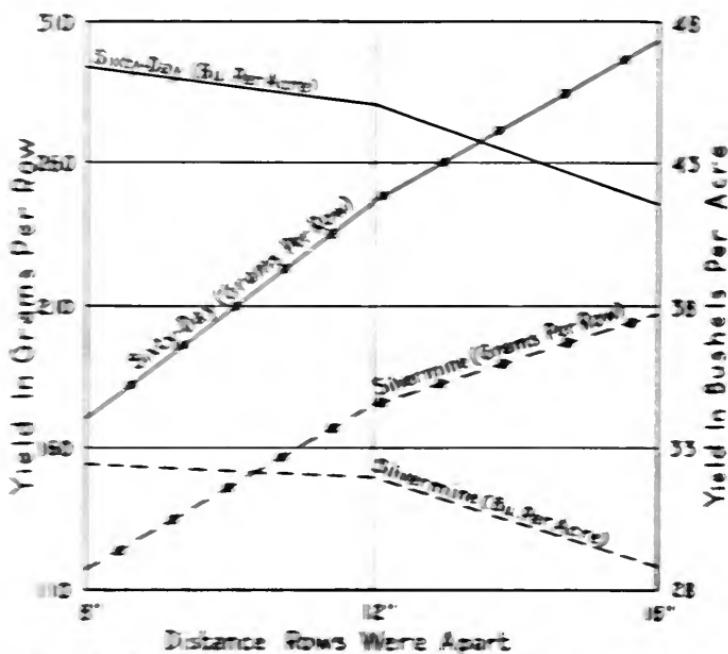


FIG. 2.—Yield of Oats as Influenced by Amount of Space Between Dual Rows.

When 11 grams of seed of Sixty-Day and Silvermine oats were sown in rod rows, the yield of grain per row increased with an increase in the distance between rows, but the yield per acre decreased.

data, only 4.7 bushels (Table 12 and Figs. 3 and 4). If the same amount of seed had been sown per acre, it is probable that the difference would have been even less.

COLD RESISTANCE OF OAT VARIETIES

The importance of sowing oats early has been emphasized. The ability of oat seedlings to withstand low temperatures is, however, not so great as that of spring wheat or barley, and it is possible to sow oats so early as to subject them to severe injury from subfreezing weather after the plants have emerged. Some varieties show a much greater resistance to cold weather in the spring than do others. In the spring of 1928 there were six severe frosts after the oats, seeded on March 20, had emerged. On May 4, when the dead plants were

readily distinguishable from those that had only been injured. Duplicate counts were made of the plants of each variety in a 3-foot length of drill row.



FIG. 4.—Oats Production by Different White Drill Rows

The boundaries are representative samples of a crop of Sixty-Day oats seeded at the rate of 11 grams per square meter in single rows that were 5, 12, and 16 inches apart.

The results of this one season's work showed a range in percentage killed of 0 to 40.8. Kansas was the only variety that suffered no mortality during the six freezes. This is not surprising when it is considered that Kansas was developed as a selection from Red Texas, which is grown largely as a winter oat in the South. The other varieties, listed in the order of their ability to withstand injury from cold, were: Sixty-Day (Illinois selection), Minota, Hull-less, Anthony, Gopher, Fowle's Hull-less, Burn, Cornelius, Sunn Prairie, Siberian, Iowar, Sixty-Day, Texas Red, Alburn, Great Avalanche, Miami, Ingold, Ingram, Rockland, Naesgaard, Merkin, Big Four, Nebraska 21, Nova, Silvermine, Silver.

SUMMARY

Silvermine 6-403, Iowar, Albion (Iowa 103), Richland (Iowa 105), and Kanota, in the order stated, are the highest-yielding varieties of oats grown for a minimum of five years on the DeKalb field, in northern Illinois.

Gopher, Albion (Iowa 103), Kanota, Richland (Iowa 105), and State Pride (Wisconsin 7) are the most productive varieties that have been tested on the Urbana field, in central Illinois, for a minimum of four years.

At Alhambra, in southern Illinois, the five highest-yielding oats tested for a minimum of four years are Victory, Silvermine, Albion (Iowa 103), Burt, and Sixty-Day. An important hazard to oat growing in southern Illinois is believed to be inability to sow the crop sufficiently early.

Hull-less oats, over a five-year period, gave average yields comparing very favorably with the best hulled varieties, considering the quantity of hull-free grain produced.

A 16-peck rate of seeding proved best with Silvermine oats at DeKalb, but with Sixty-Day oats at Urbana the net yield increased as the rate of seeding increased up to a maximum of 18 pecks an acre.

Results of seeding oats in 4- and 8-inch drill rows were not decisive. They were in favor of 4-inch rows during two seasons and of 8-inch rows during the other year of the three in which tests on width of drill row were conducted. Preliminary observations indicate that in the interest of securing adequate stands of clover, the 8-inch drill row is to be preferred to closer seeding, and that even a wider drill row may be advisable, especially on thinner soils.

Ability to endure early spring freezes varied considerably in the seedlings of different varieties. Kanota, Sixty-Day (Illinois selection), Minota, Hull-less, Anthony, Gopher, Fowld's Hull-less, Burt, Cornelian, and State Pride (Wisconsin 7) proved more resistant than others.

ORIGIN AND DESCRIPTION OF VARIETIES

A brief statement of the origin, when known, a general description, and the yield rank of the different oats used in these field trials are presented here. The varieties are listed in alphabetical order for the purpose of ready reference. In the preparation of this list liberal use has been made of the material contained in Bulletin 1343 of the U. S. Department of Agriculture, "Improved Oat Varieties for the Corn Belt," by L. C. Burnett, T. R. Stanton, and C. W. Warburton; an article, "Registration of Varieties and Strains of Oats," by T. R. Stanton, Fred Griffee, and W. C. Etheridge in Vol. 18, pages 935-947, of the *Journal of the American Society of Agronomy*; and Bulletin 164 of the North Dakota Station, "Varietal Trials With Oats in North Dakota," by Theodore E. Stoa.

Albion (Iowa 103). Product of a single plant selected from Kherson by Iowa Station in 1906. An early oat; grain small, white; panicle open; straw short and medium fine. Seed obtained from the Iowa Station in 1915.

Yield: thirteen-year average at Urbana 62.1 bushels, rank 2; thirteen-year average at DeKalb 72.7 bushels, rank 3; ten-year average at Alhambra 31.4 bushels, rank 3.

American Banner. Developed from a small original stock of seed and introduced by James Vick, seedsman, Rochester, N. Y., in 1886. A midseason oat; grain medium large and white with short awns; panicle open, tho strains that go under the name American Banner possess the side panicle; straw long. Seed obtained from Farmers' Seed Company, Faribault, Minn., in 1902.

Yield: twenty-four year average at Urbana 51.4 bushels, rank 27; ten-year average at DeKalb 60.0 bushels, rank 26.

Anthony (Minnesota 686). Product of a cross of Victory and White Russian made by Minnesota Station. Anthony is similar in habit of growth to Victory, and in addition has proved highly resistant to black stem rust. Anthony has shown considerable promise in yield tests of the Minnesota Station, and is being increased in 1929 for distribution to Minnesota farmers. A midseason variety; grain white; panicle open; straw long. Seed obtained from Minnesota Station in 1928.

Yield: one year at Urbana 83.3 bushels. Average of 26 varieties grown same year, 70.5 bushels.

Big Four. Introduced to seed trade by John A. Salzer Seed Company, LaCrosse, Wis., in 1899. Origin is not known. Big Four resembles Silvermine in most respects. A midseason oat; grain white, medium long; panicles open, somewhat drooping; straw long and moderately stiff. Seed first obtained from above company, in 1902.

Yield: fourteen-year average at Urbana 59.9 bushels, rank 10; thirteen-year average at DeKalb 67.8 bushels, rank 12; ten-year average at Alhambra 30.2 bushels, rank 9.

Black Tartarian. A late oat. Grain black or brown, long-pointed, awns usually present, dark colored, and twisted at the base; panicle side compact and stiff; straw long and moderately stiff. Seed obtained from Vaughan Seed Company, Chicago, in 1901 and 1915.

Yield: nine-year average at Urbana 39.7 bushels, rank 44; five-year average at DeKalb 53.8 bushels, rank 35.

Bryant Silver Plume. A midseason to late oat in time of maturity; grain

white; panicle side; straw medium to long. Seed obtained from W. C. Bryant, Princeton, Ill., in 1912.

Yield: ten-year average at Urbana 53.1 bushels, rank 22; five-year average at DeKalb 65.4 bushels, rank 16; four-year average at Alhambra 21.4 bushels, rank 11.

Burt. Selection made from Red Rustproof about 1878 by a man named Burt who is reported to have lived at the time in Greene county, southern Alabama. A very early oat; grain reddish-brown, characteristically flattened; panicle open; straw short and fine; variety as generally grown is made up of a number of strains which gives it a non-uniform appearance. Seed obtained for variety tests in 1920.

Yield: nine-year average at Urbana 58.7 bushels, rank 9; five-year average at DeKalb 68.3 bushels, rank 33; six-year average at Alhambra 39.6 bushels, rank 4.

Colorado 37. Selected in 1900 from a field of commercial oats in the San Luis Valley of southwestern Colorado by the Colorado Station. A midseason common oat, similar to Swedish Select; grain white with fewer awns than Swedish Select; panicle open; straw mid-long, stiff. Seed obtained from Colorado Agricultural College in 1927.

Yield: one year at DeKalb 42.2 bushels; average of 13 varieties grown same year 57.0 bushels.

Cornellian. A pure-line selection from Canada Cluster, made by Department of Plant Breeding, Cornell University, in 1912. A midseason common oat; grain slender, gray, awnless, with low percentage of hull; panicle open; straw long. Seed obtained from New York Station, Ithaca, in 1923.

Yield: six-year average at Urbana 64.7 bushels, rank 14; five-year average at DeKalb 66.6 bushels, rank 30.

Crown. A midseason oat of Swedish origin; grain white, large; panicle open; straw long. Seed obtained for variety tests in 1922.

Yield: one year at Urbana 42.4 bushels; average of twenty-eight varieties grown same year 48.6 bushels.

Danish White. An oat similar to Swedish Select in most respects; mid-season; grain white; panicle open; and straw mid-long to long. Seed obtained from Burpee Seed Company, Philadelphia, in 1901.

Yield: eighteen-year average at Urbana 48.1 bushels, rank 31; eight-year average at DeKalb 61.2 bushels, rank 23.

Early Champion. Origin unknown. Similar in appearance to selections with white kernels from Sixty-Day and Kherson. Slightly earlier in maturity than Sixty-Day; grain small, white; panicle open; straw short, fine. Seed purchased in 1902 from Iowa Seed Company, Des Moines, and in 1910 a new stock of seed was secured from Ralph Allen, Delavan, Ill.

Yield: ten-year average at Urbana 47.0 bushels, rank 39; four-year average at DeKalb 66.7 bushels, rank 15.

Fowld's Hull-less. Result of a cross between Kilby Hull-less and Swedish Select. It is practically identical with the Liberty Hull-less. A midseason oat; grain hull-less, large; panicle open; straw mid-long. Seed obtained from South Dakota Station in 1928.

Yield: one year at Urbana 1,721.6 pounds; average of 26 hulled varieties grown same year 2,256.0 pounds, which, with a 30 percent reduction for hull, is equivalent to 1,579.2 pounds of hull-free grain.

Garton 5. A midseason oat; of English origin; grain white; panicle open; straw long. Seed obtained from Garton-Cooper Seed Company, Sugar Creek, Ill., in 1913.

Yield: seven-year average at Urbana 51.5 bushels, rank 32; five-year average at DeKalb 55.6 bushels, rank 37.

Garton Victor. A late oat; grain black; panicle open, very large; straw long. Seed obtained from Garton Seed Company, Chicago, in 1911.

Yield: four-year average at Urbana 59.8 bushels, rank 38; three-year average at DeKalb 63.7 bushels, rank 34.

Golden Rain. A midseason to late Swedish oat; grain yellow, mid-size; panicle open; straw long. Seed obtained from Svalof, Sweden, in 1922.

Yield: two-year average at Urbana 42.3 bushels; average of 28 varieties grown same years 51.2 bushels.

Gopher. Pure-line selection from Sixty-Day made by Minnesota Station in 1917. An early oat similar to Albion (Iowa 103); grain white, slightly plumper than Albion; panicle open; straw short and stiff. Seed obtained from Minnesota Station in 1925.

Yield: four-year average at Urbana 69.8 bushels, rank 1; one year at DeKalb 81.5 bushels; average of 15 varieties grown same year 79.8 bushels; one year at Alhambra 58.9 bushels, average of ten varieties grown same year 56.0 bushels.

Great American. A midseason oat, somewhat like Silvermine; grain white; panicle open; straw mid-long. Seed obtained from Funk Brothers Seed Company, Bloomington, Ill., in 1910.

Yield: thirteen-year average at Urbana 57.8 bushels, rank 15; seven-year average at DeKalb 66.2 bushels, rank 8; five-year average at Alhambra 24.0 bushels, rank 7.

Great Avalanche. An oat said to have been developed by the late Luther Burbank. A midseason to late variety; grains white, short, very plump; panicle open; straw mid-long. Seed obtained from H. L. Stiegelmeier, Normal, Ill., in 1928.

Yield: one year at Urbana 70.9 bushels; average of 26 varieties grown same year 70.5 bushels.

Hull-less. The place of origin of hull-less or naked oats is believed to be central and eastern Asia. These oats were grown in England as early as 1550. The naked oat used in the variety tests reported in this bulletin is probably a strain of the Chinese Hull-less. It is early to midseason in time of maturity; spikelets multiflorous; grain free of hull or naked; panicle open and drooping; straw short and slightly weaker than Sixty-Day. Seed obtained from C. S. Schnebley, Monica, Ill., in 1924.

Yield: five-year average at Urbana 1,535.1 pounds; average of all hulled varieties grown same years, less 30 percent for hull, is 1,480.2 pounds.

Hvitling. Product of pure-line selection made about 1900 by Plant Breeding Station, Svalof, Sweden, from the Probsteier oat. Similar to or identical with Victory. A midseason oat; grain white, medium size; panicle open, fairly erect; straw long, medium coarse. Seed obtained from Vaughan Seed Company, Chicago, in 1915.

Yield: four-year average at DeKalb 67.3 bushels, rank 13.

Iogold. Result of a single plant selection from Kherson by the Iowa Station in 1906. An early oat; grain yellow; panicle open; straw somewhat longer than most early oats, unusually stiff and notably resistant to stem rust. Iogold was developed especially for use on worn soils where most early oats are too short to be harvested readily with a binder. Seed obtained from Iowa Station in 1927.

Yield: two-year average at Urbana 64.9 bushels; average of all the varieties grown same years 64.5 bushels; one year at DeKalb 84.3 bushels; average of

15 varieties grown same year 79.5 bushels; one year at Alhambra 47.9 bushels, average of 10 varieties grown same year 56.0 bushels.

Logan. A pure-line selection from Green Russian made by Iowa Station in 1911 and first distributed to farmers in 1922. A midseason oat; grain yellow to white, tip having a greenish tinge at maturity; panicle spreading, drooping; straw rather long under certain conditions somewhat resistant to stem rust. Seed obtained from Iowa Station in 1923.

Field: six-year average at Urbana 63.1 bushels, rank 19; six-year average at DeKalb 55.1 bushels, rank 6.

Lower. A single plant selection from Ehrenson made by the Iowa Station in 1916 first distributed in 1924. Slightly later than Sixty-Day; grain small, usually awned, straw somewhat taller and stiffer than Sixty-Day. Seed obtained from Iowa Station in 1927.

Field: seven-year average at Urbana 63.1 bushels, rank 13; eight-year average at DeKalb 55.2 bushels, rank 21; six-year average at Alhambra 39.0 bushels, rank 6.

Iron Viking. Introduced into this country by a seed company in Iowa. A midseason oat of the Silverume type; grain white; panicle open; straw long with moderately light foliage. Seed obtained in 1911 from Iowa Seed Company, Des Moines.

Field: twenty-two-year average at Urbana 55.5 bushels, rank 21; eight-year average at DeKalb 51.7 bushels, rank 19.

Lenore. A strain of Fulghum oats, also included under the general group name Red Rustproof, discovered by the Kansas Station to possess superior yielding ability and unusual hardness. It occupies a position more or less intermediate between the red-oat and the white-oat groups. A very early oat capable of withstanding unfavorable conditions and of producing highest yields when sown early in the season. grain brownish red; panicle open; straw short, stiffer and somewhat coarser than that of Sixty-Day. Seed obtained from Kansas Station in 1922.

Field: six-year average at Urbana 65.6 bushels, rank 3; five-year average at DeKalb 74.4 bushels, rank 5; six-year average at Alhambra 21.9 bushels, rank 14.

Ehrenson. A variety introduced by F. W. Taylor of the Nebraska Station in 1896 from the Province of Ehrenson in southern Russia. Similar botanically to Sixty-Day which was obtained five years later from an adjoining Russian province. An early oat; grain small, yellow to white; panicles open, short; straw short. Seed obtained from Vaughan Seed Company, Chicago, in 1909.

Field: twenty-two-year average at Urbana 56.2 bushels, rank 37.

Lincoln. Named and introduced by Nordrup, Braslaw, Goodwin Seed Company, Minneapolis, in 1893. Information as to the strain from which this variety was developed is lacking. A midseason variety; grain white and fairly large; panicle open, straw tall. Seed obtained from Vaughan Seed Company, Chicago, in 1909.

Field: twenty-year average at Urbana 46.7 bushels, rank 36; eight-year average at DeKalb 60.2 bushels, rank 25.

Mammoth Cluster. A midseason to late variety; grain white, large, and upright in percentage of hull; panicle side; straw, rather long. Seed obtained from L. P. Gibson and Company, Rochester, N. Y., in 1914.

Field: six-year average at Urbana 51.0 bushels, rank 42; five-year average at DeKalb 44.2 bushels, rank 22.

Marion. Originated as a pure line by the Oregon Station from an unnamed oat (C. I. No. 367) in 1911. A midseason common oat; possessing im-

maturity from the smut; grain yellowish-white; panicle open, large and drooping; straw mid-long and fairly stiff. Seed obtained from Oregon Station in 1926.

Yield: one year at Urbana 34.5 bushels; average of 26 varieties grown same year 70.5 bushels.

Miami (Ohio 522). The result of a selection from Siberian by the Ohio Station. A midseason oat; grain white, large; panicle open; straw long. Seed obtained for variety tests in 1925.

Yield: four-year average at Urbana 46.5 bushels, rank 14.

Minnesota 6. A pure-line selection from Silvermine made by the Minnesota Station. A midseason variety; grain white; panicle open; straw mid-long. Seed obtained for variety test plots in 1926.

Yield: nineteen-year average at Urbana 51.2 bushels, rank 15; thirteen-year average at DeKalb 61.9 bushels, rank 5.

Minota. A pure-line selection from an unnamed commercial variety made by the Minnesota Station probably as early as 1910. A midseason oat similar in some respects to Green Russian; grain yellowish-white; panicle open; straw rather short for a midseason oat, but comparatively stiff. Seed obtained from Minnesota Station in 1925.

Yield: four-year average at Urbana 47.0 bushels, rank 4; one year at DeKalb 79.1 bushels; average of the 16 varieties grown same year 74.5 bushels; one year at Alhambra 60.7 bushels; average of the ten varieties grown same year 56.0 bushels.

Naesgaard. A Danish variety, late in maturity; grain yellow, large; panicle open; straw long. Seed obtained from Frederiksberg, Maribo, Denmark, in 1924.

Yield: five-year average at Urbana 37.3 bushels, rank 42.

Nebraska 11. A pure-line selection from Elsner made by the Nebraska Station in 1907, and distributed to growers in 1917. Equally as early as Elsner; grain white, but otherwise similar to Elsner; panicle open; straw short, fine, slightly stiffer than that of Sixty-Day. Seed obtained from Nebraska Station in 1928.

Yield: one year at Urbana 59.6 bushels; average of 26 varieties grown same year 70.5 bushels.

Nova. A midseason oat of Danish origin; grain white; panicle open; straw mid-long. Seed obtained from Frederiksberg, Maribo, Denmark, in 1924.

Yield: five-year average at Urbana 46.4 bushels, rank 15; four-year average at DeKalb 49.9 bushels, rank 10; one year at Alhambra 56.4 bushels; average of the 10 varieties grown same year 50.0 bushels.

President. A midseason oat; grain white; panicle open; straw mid-long. Seed obtained from Garren-Cooper Seed Company, Sugar Grove, Ill., in 1914.

Yield: eight-year average at Urbana 51.5 bushels, rank 13; five-year average at DeKalb 65.4 bushels, rank 17; three-year average at Alhambra 27.2 bushels, rank 15.

Richland (Iowa 115). Original plant selection from Elsner was made by the Iowa Station in 1906, and because of its excellent yield record was distributed to growers in 1914. An early oat; grain creamy white to yellow; panicle open; straw short, slightly stiffer than that of Elsner. Said to grow in the soil without lodging, resistant to stem rust. Seed obtained from Iowa Station in 1926.

Yield: fourteen-year average at Urbana 41.5 bushels, rank 7; twelve-year average at DeKalb 72.2 bushels, rank 4; four-year average at Alhambra 28.9 bushels, rank 12.

Schoenonen. A midseason oat; grain white; panicle open; straw long. Seed obtained from an unrecorded source in 1914 and from Joseph Fetterell, Champaign, Ill., in 1926.

Yield: seventeen-year average at Urbana 51.5 bushels, rank 24; eleven-year average at DeKalb 58.2 bushels, rank 24.

Scottish Chief. A midseason oat; grain white; panicle open; straw long. Seed obtained from L. L. Olds Seed Company, Madison, Wis., in 1915.

Yield: six-year average at Urbana 49.7 bushels, rank 35; five-year average at DeKalb 67.5 bushels, rank 9.

Siberian. Introduced into Ontario, Canada, from Siberia, Russia, in 1889. The original Siberian is similar to Silvermine. A midseason oat; grain medium large and white; panicles open and drooping; straw long. Seed obtained for variety tests in 1902.

Yield: twenty-four-year average yield at Urbana 51.9 bushels, rank 30; eight-year average at DeKalb 55.6 bushels, rank 32; four-year average at Alhambra 23.3 bushels, rank 8.

Silvermine. Origin not definitely known, but was introduced to the seed trade by John A. Salzer Seed Company, LaCrosse, Wis., in the late nineties. Botanically, Silvermine is similar to Swedish Select. A midseason oat; grain white and fairly plump; panicles open and drooping; straw long and moderately stiff. Seed obtained first in 1902 from Iowa Seed Company, Des Moines.

Yield: twenty-year average at Urbana 54.8 bushels, rank 20; fifteen-year average at DeKalb 64.4 bushels, rank 7; ten-year average at Alhambra 31.5 bushels, rank 2.

Silvermine 6-403. The product of an individual plant selection from Silvermine by the Division of Plant Breeding, Illinois Station, in 1906. Time of maturity and plant characters are similar to the parent Silvermine variety. First grown in the general oat-variety test plots at DeKalb in 1914.

Yield: five-year average at Urbana 45.7 bushels, rank 11; thirteen-year average at DeKalb 68.6 bushels, rank 1.

Sixty-Day. An importation by the U. S. Department of Agriculture in 1901 from Dr. S. de Morzinski of Proskurov, in the province of Podolia, Russia. Similar to Kherson. An early oat but does not mature in sixty days as the name might imply; grain small, white to yellow, relatively low in percentage of hull; panicles open, short; straw short, with tendency to lodge on fertile soil; variety, as generally grown, lacks considerably in uniformity. Seed obtained from the South Dakota Station in 1906.

Yield: twenty-four-year average at Urbana 58.0 bushels, rank 7; sixteen-year average at DeKalb 62.1 bushels, rank 29; ten-year average at Alhambra 31.2 bushels, rank 5.

Sixty-Day (Selected). A mass selection from the Illinois Station strain of Sixty-Day made by the Division of Plant Breeding. The object of the selection was to secure a more uniform, and perhaps a more productive strain of this variety.

Yield: three-year average at Urbana 67.9 bushels, rank 28.

Sixty-Day 13-304. Product of an individual plant selected from Sixty-Day by the Division of Plant Breeding, Illinois Station. Time of maturity, and general plant characters are the same as Sixty-Day, except that the grain is white. First grown in the general oat-variety test plots in 1919.

Yield: six-year average at Urbana 49.9 bushels, rank 12; five-year average at DeKalb 63.9 bushels, rank 11.

Silver (Novelty). A late oat of Danish origin; grain white and large; panicle open; straw long. Seed obtained from Frokornpagniet, Mariba, Denmark, in 1924.

Yield: five-year average at Urbana 58.9 bushels, rank 40.

State Pride. (Wisconsin 7). Pure line selection by Wisconsin Station from Kherson in 1907. An early oat adapted to fertile soil; grain yellow, thin-hulled, and small; panicle open, compact; straw short but taller than Kherson. Seed obtained from the Wisconsin Station in 1921.

Yield: seven-year average at Urbana 64.5 bushels, rank 6; eight-year average at DeKalb 67.8 bushels, rank 18.

Swedish Select. First introduced into this country by M. A. Carleton from St. Petersburg Province of Russia. E. A. Bessey made a second introduction of this variety in 1903 from Moscow. The original section which gave rise to this variety was made in Sweden from the Ligowo oat. It was carried to Finland, thence to Russia where its possibilities of adaptation to American conditions were noted by Mr. Carleton. Swedish Select is midseason in maturity; grain large, white, usually possessing an awn; panicle open; straw long, strong. Seed first obtained from Iowa Seed Company, Des Moines, in 1902.

Yield: fourteen-year average at Urbana 52.3 bushels, rank 29; seventeen-year average yield at DeKalb 63.3 bushels, rank 31.

Texas Red. Also known as Rust Proof and Red Rustproof. Originated in southern United States, where it is grown as both a winter and a spring oat. A midseason oat as grown in Illinois, but some strains early and others late; grain reddish-brown, characteristically flattened, thick hulled, and heavily awned; panicle open, spreading; straw medium in length. Seed obtained of C. A. Rowe, Jacksonville, Ill., in 1909; of Clifford Slonniger, Mattoon, Ill., in 1911; and of Funk Brothers Seed Company, Bloomington, Ill., in 1915.

Yield: twelve-year average at Urbana 57.1 bushels, rank 16; five-year average at DeKalb 64.5 bushels, rank 20; four-year average at Alhambra 18.8 bushels, rank 16.

Victory. Developed at the Plant Breeding Station, Svalof, Sweden, from a single plant selection out of a variety known as Probsteier. Introduced into this country by the U. S. Department of Agriculture in 1908. A midseason variety; grain white and plump; panicles open, rather dense; straw tall, fairly stiff. Seed obtained from L. L. Olds Seed Company, Madison, Wis., in 1916, and from Central Illinois Seed Company, Shelbyville, Ill., in 1919.

Yield: nine-year average at Urbana 53.6 bushels, rank 23; four-year average at DeKalb 64.6 bushels, rank 27; four-year average at Alhambra 24.4 bushels, rank 1.

White Bonanza. A midseason variety; grain medium in size, white; panicle open; straw coarse and long. Seed obtained of John A. Salzer Seed Company, LaCrosse, Wis., in 1901.

Yield: twenty-one-year average at Urbana 51.0 bushels, rank 18; seven-year average at DeKalb 61.5 bushels, rank 21; four-year average at Alhambra 20.2 bushels, rank 13.

White Russian. An early introduction from Europe. There is no definite record of its origin. A late variety, resistant to stem rust. Grain white, and somewhat slender; panicle side, long, and drooping; straw long; foliage heavy. Seed obtained of John A. Salzer Seed Company, LaCrosse, Wis., in 1915.

Yield: six-year average at Urbana 47.2 bushels, rank 41; four-year average at DeKalb 56.9 bushels, rank 36.

Wisconsin Wonder. (Wisconsin Pedigree No. 1). The increase of a plant selection made by the Wisconsin Station from a strain of oats grown locally under the name of White Bonanza. A midseason oat; grain white; panicle open, spreading; straw long and resistant to lodging even when grown on rich soil. Seed first obtained from L. L. Olds Seed Company, Madison, Wis., in 1915.

Yield: ten-year average at Urbana 56.5 bushels, rank 26; five-year average at DeKalb 66.4 bushels, rank 14; four-year average at Alhambra 21.4 bushels, rank 10.

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